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Geant4 and MCNPX: Comparison of Electron Beam Transport Simulation

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The Europa Jupiter System Mission (EJSM) would consist of two primary flight elements operating in the Jovian system: the NASA-led Jupiter Europa Orbiter (JEO) and the ESA-led Jupiter Ganymede Orbiter (JGO). JEO and JGO would execute a choreographed exploration of the Jupiter System before settling into orbit around Europa and Ganymede, respectively. The JEO concept is designed to follow-up on the major discoveries of the Galileo and Voyager missions at Europa, especially its ocean.

Instruments on JEO mission would be subjected to intense radiation environments from high energy trapped electrons and protons in Jovian magnetosphere among others. As a part of detector shielding modeling efforts to support the JEO mission, electron beam simulations through slab geometry made of aluminum and tantalum were chosen to be performed using MCNPX and Geant4 computer code. This paper documents the measures taken in setting up physics models and selecting datasets in Geant4 and MCNPX, and reports the result of the analysis. As will be shown, when comparable physics models and data were chosen, results produced for electron, gamma, neutron fluxes and energy deposition by the two codes show good agreement.

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